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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/761,489	01/16/2001	Hadi Abdul-Ridha	99CON103P-DIV1	5870

7590 04/02/2002  
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EXAMINER

HA, NGUYEN T

ART UNIT	PAPER NUMBER
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2831

DATE MAILED: 04/02/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

**Application No.**

09/761,489

**Applicant(s)**

ABDUL-RIDHA ET AL.

**Examiner**

Nguyen T Ha

**Art Unit**

2831

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 16 January 2001.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 7-11 and 21-47 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) 21-47 is/are allowed.
- 6) ☒ Claim(s) 7-11 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claims \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

### Priority under 35 U.S.C. § 119

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

### Attachment(s)

- 15) ☒ Notice of References Cited (PTO-892)
- 16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 17) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 18) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 19) ☐ Notice of Informal Patent Application (PTO-152)
- 20) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Response to Arguments***

1. Applicant's arguments with respect to claims 7-11 have been considered but are moot in view of the new ground(s) of rejection.
2. Regarding claims 21-33, applicant has argued that DeBoer and Jain are silent with respect to a structure capacitor comprising a copper seed layer over a first barrier layer, a dielectric comprising tantalum nitride over the copper seed layer.
3. With respect to claims 34-47, applicant has argued that DeBoer and Jain are silent with respect to a capacitor comprising a bottom interconnect metal segment, a first barrier layer, a seed layer, a dielectric, a second barrier layer, and a top interconnect metal segment all fabricated in a single tool.
4. The examiner finds the argument in (2) and (3) persuasive therefore, the examiner made a decision to allow these limitations over the prior of record.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

5. Claims 7, 10 and 11 are rejected under 35 U.S.C. 102(e) as being anticipated by DeBoer et al (6,146,959).

Regarding claims 7, DeBoer et al discloses a structure (figures 2-5) comprising a first capacitor electrode (34), a second capacitor electrode (50), a dielectric (40) comprising ceramic tantalum nitride situated said first and second capacitor electrodes (figure 5).

Regarding claims 10&11, the limitations of the structure wherein the dielectric comprising ceramic tantalum nitride is fabricated using a method comprising the steps of utilizing an ionized metal plasma tool for creating a plasma containing tantalum ions, said plasma being sustained by a mixture of gases containing nitrogen; depositing said dielectric comprising ceramic tantalum nitride on the first capacitor electrode wherein a percentage of nitrogen partial flow in the mixture of gases is adjusted so as to cause a nitrogen content in the dielectric comprising ceramic tantalum nitride to be at least 30% and 60% have been consider, however, the presence of process limitations in product claims, which product does not otherwise patentably distinguish over the prior art, cannot impart patntability to the product. In re Stephens 145 USPQ 656 (CCPA 1965).

### ***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of

the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 8-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over DeBoer et al (6,146,959) in view of Catala et al (5,170,318).

Regarding claims 8,9 DeBoer et al discloses all the limitations discussed above with respect to claim 7, except for the first capacitor electrode and second capacitor electrode are made of copper. However, Catala et al teaches the first and second electrodes are made of copper (column 6 lines 60-61). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify DeBoer et al capacitor as taught by Catala to have the first and second electrodes are made of copper because copper has low adhesion to tantalum nitride, therefore the invention used the copper for the electrodes in order to improve the conductivity for the capacitors.

#### ***Allowable Subject Matter***

8. Claims 21-47 are allowed.

The following is an examiner's statement of reasons for allowance:

With respect to claims 21-33, the prior art alone or in combination does not teach the limitations of the structure capacitor comprising a first barrier layer over the bottom

copper interconnect metal segment, a copper seed layer over the first barrier layer, a dielectric comprising tantalum nitride over copper seed layer, and a second barrier layer over the dielectric.

With respect to claims 34-47, the prior art alone or in combination does not teach the limitation of the capacitor comprising a first barrier layer over the bottom interconnect metal segment, a seed layer over the first barrier layer, a dielectric over the seed layer, a second barrier layer over the dielectric and a second capacitor electrode comprising a top interconnect metal segment, wherein the bottom interconnect metal segment, the first barrier layer, the seed layer, the dielectric, the second layer and the top interconnect metal segment are fabricated in a single tool.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

#### **Citation of Relevant Prior Art**

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- a. Watanabe et al discloses a process for forming a semiconductor.
- b. Chooi et al discloses an integration of silicon-rich material in the self-aligned via.
- c. Deboer et al (6,180,481) discloses a barrier layer fabrication methods.


**Conclusion**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nguyen T Ha whose telephone number is 703-308-6023. The examiner can normally be reached on Monday-Friday from 8:30AM to 6:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dean Reichard can be reached on 703-308-3682. The fax phone numbers for the organization where this application or proceeding is assigned are 703-305-3432 for regular communications and 703-305-3431 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

NH  
03/21/2002

 3/22/02  
DEAN A. REICHARD  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2800